Ordering number: EN3227A

Monolithic Linear IC



No.3227A

LA4630N

9V/12V 3-Dimension Power IC for Radio Cassette Recorders

Features

- Stereo section 9V/3Ω 3W×2, 12V/3Ω 5W×2: noise filter capacitorless power
- Super bus section 9V/3Ω 6W, 12V/3Ω 10W: output capacitor, B-S capacitorless power
  This chip employs technology for eliminating pins and external connections to realize 3-dimensional power on a single chip. This IC is a single package power IC for making sound systems with punch.
- On-chip pop noise suppressor
- On-chip power switch circuit
- External and mute functions on chip
- Protection functions on chip (thermal protection circuit and BTL section R_L short protection circuit)

Absolute Maximum Ratings at Ta = 25°C

				unit
Maximum Supply Voltage	V_{CC} max	*1 no signal	20	V
Thermal Resistance	θ_{j-c}		2	°C/W
Maximum Output Current	I_o peak		3	A
Allowable Power Dissipation	$P_d$max	With infinite heat sink	37.5	W
Operating Temperature	Topr		−20 to +75	°C
Storage Temperature	Tstg		−40 to +150	°C

Operating Conditions at Ta=25°C

				unit
Recommended Supply Voltage	V_{CC}		9	V
			12	V
Recommended Load Resistance	R_L		3 to 8	Ω
Operating Voltage Range	Vcc op	*2	5 to 18	V

*1: Operational notes on the maximum supply voltage

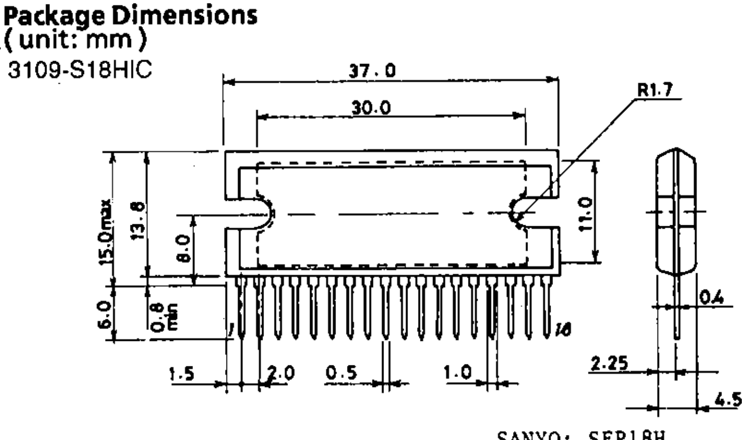
FRONT L/R	BTL	V_{CC} max	Conditions
$R_L \geqq 3\Omega$	$R_L \geqq 3\Omega$	20V	No signal [Front L/R input with capacitor Rg=0 / BTL L/R input without capacitor Rg=0]
$R_L \geqq 3\Omega$	$R_L \geqq 4\Omega$	21V	
$R_L \geqq 3\Omega$	$R_L \geqq 5\Omega$	22V	
$R_L \geqq 3\Omega$	$R_L \geqq 6\Omega$	23V	
$R_L \geqq 3\Omega$	$R_L \geqq 7\Omega$	24V	
$R_L \geqq 3\Omega$	$R_L \geqq 8\Omega$	24V	

For power supply transistor regulation, the equivalent power supply line resistance is 3Ω or greater.

*2: The upper limit for V_{CC}op is V_{CC}max − 2V.

Package Dimensions
(unit: mm)

3109-S18HIC

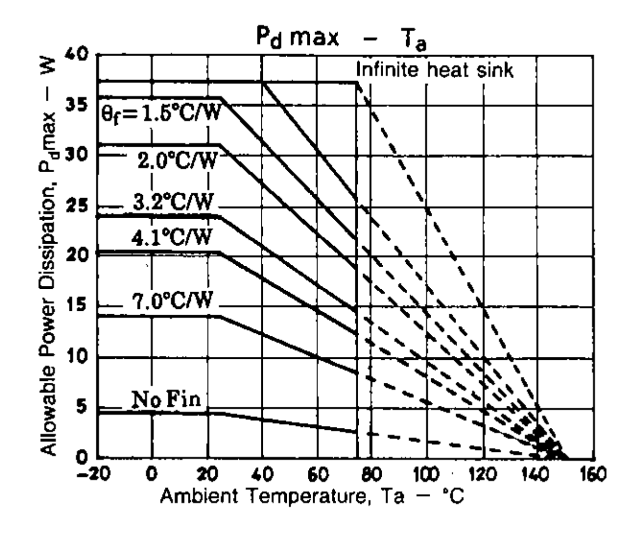


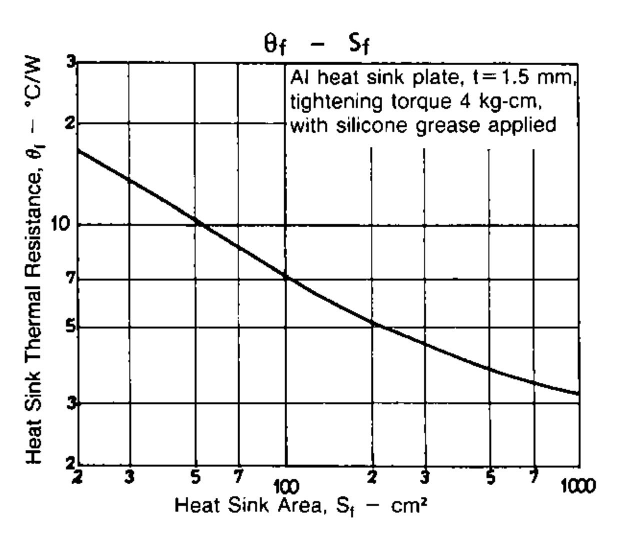
[Precaution concerning the metal]

Select P_0 with a goal of a rated load/rated supply voltage of R_L=3 to 8Ω and V_{CC}=5 to 18V and design to avoid exceeding the package $P_d$max of 37.5 W. For heavy loads or high V_{CC}, the drive design is involved and the power effect deteriorates, so pay attention to these factors.

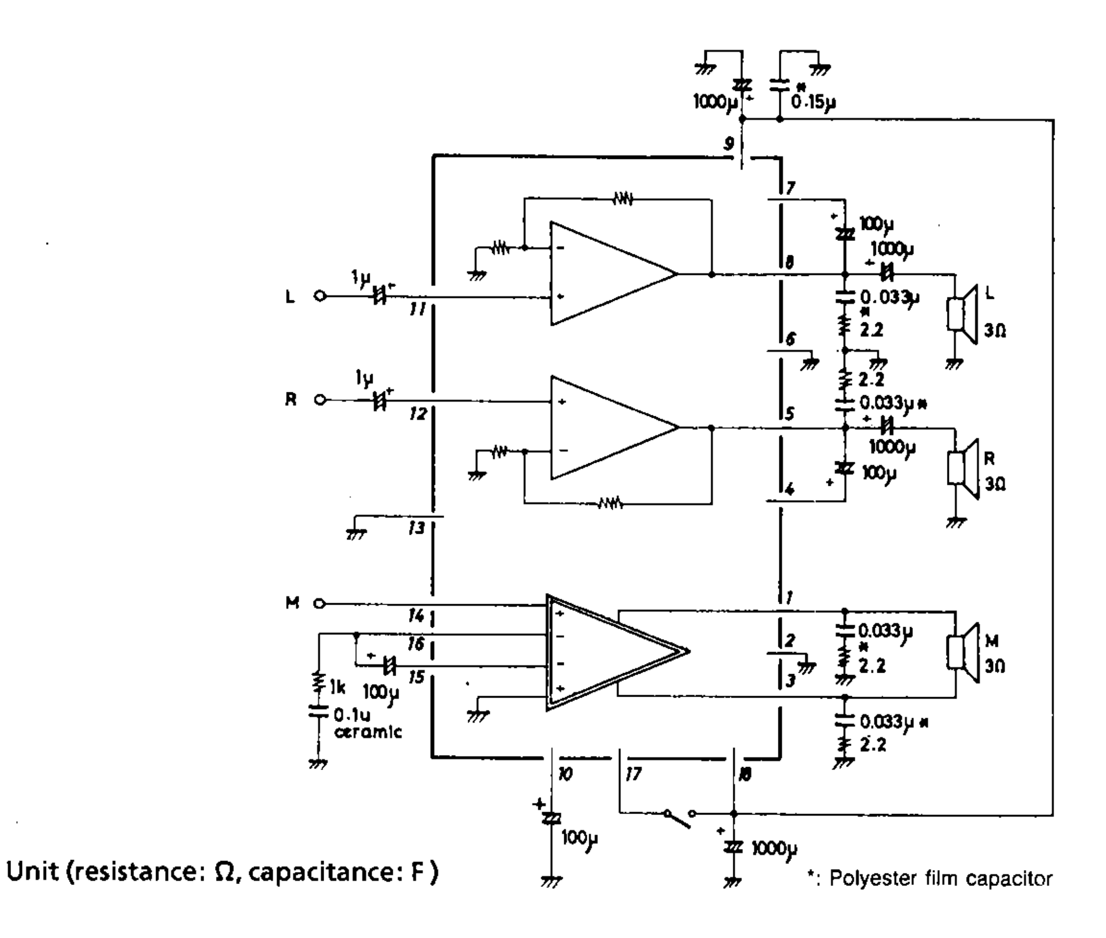
Operating Characteristics at Ta=25°C, V_{CC}=9V, R_L=3Ω, f=1kHz

			min	typ	max	unit
Quiescent Flow-in Current	I_{cco}		35	70	140	mA
Standby Current	I_{st}			1.0	10.0	μA
Power Switch Pin Flow-in Current	I_{sw}			10.0		mA
Mute Supply Flow-in Current	I_{CCm}			35.0	70.0	mA
[Stereo Section]						
Output Power	P_o1	V_{CC}=9V,THD=10%	2.2	3.0		W
	P_o2	V_{CC}=12V,THD=10%	4.2	5.0		W
Total Harmonic Distortion	THD	$V_0$1V		0.20	1.0	%
Input Resistance	R_i			50		kΩ
Voltage Gain	VG		43	45	47	dB
Output Noise Voltage	V_{NO}	Rg=0,BPF=20Hz to 20kHz		0.15	0.40	mV
Ripple Rejection	SVR	f_R=100Hz,V_R=0dBm	45	55		dB
Channel Separation	ch sep	Rg=10kΩ,V_0=0dBm	45	50		dB
Muting Attenuation	A_{tt}	V_0=0dBm		80		dB
Low-Region Roll Off Frequency	f_L	At VG= −3dB		50		Hz
High-Region Roll Off Frequency	f_H	At VG= −3dB		50		kHz
[Super Bus Section]						
Output Power	P_o1	V_{CC}=9V,THD=10%	5.0	6.0		W
	P_o2	V_{CC}=12V,THD=10%	8.0	10.0		W
Total Harmonic Distortion	THD	V_0=1V		0.20	1.0	%
Input Resistance	R_i			30		kΩ
Voltage Gain	VG		43	45	47	dB
Output Noise Voltage	V_{NO}	Rg=0,BPF=20Hz to 20kHz		0.3	0.6	mV
Ripple Rejection	SVR	f_R=100Hz,V_R=0dBm	50	60		dB
Muting Attenuation	A_{tt}	V_0=0dBm		80		dB
Low-Region Roll Off Frequency	f_L	VG: −3dB		5		Hz
High-Region Roll Off Frequency	f_H	VG: −3dB		40		kHz
Output Offset Voltage	V_{OFF}	Rg=0	−150		+150	mV





Block Diagram



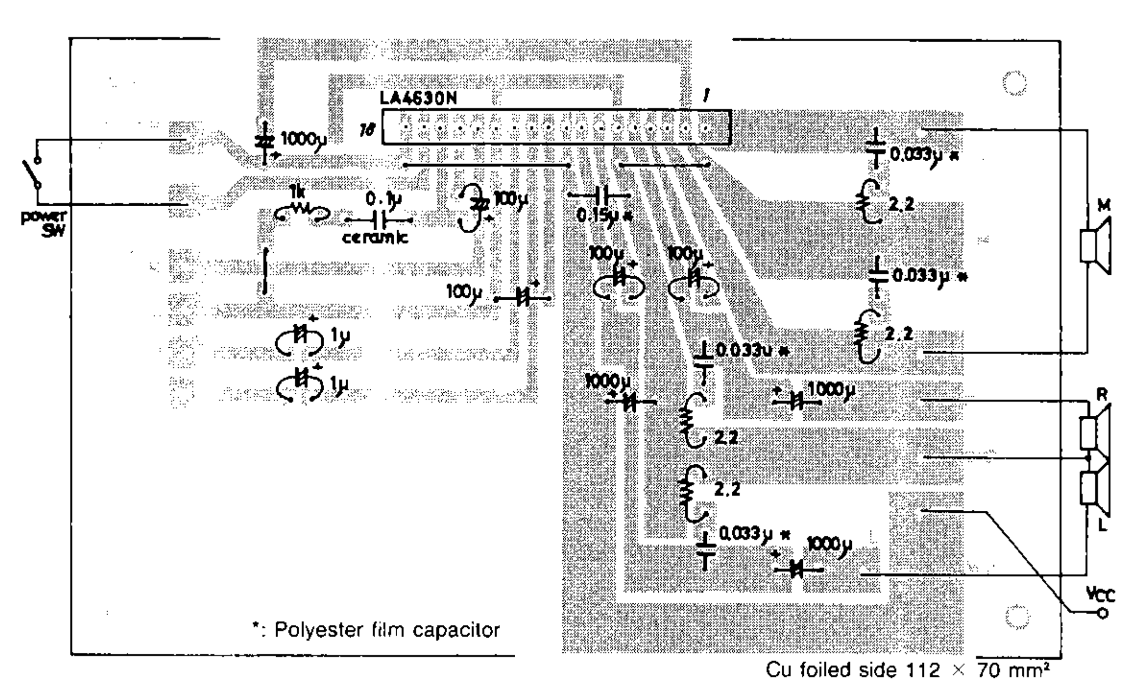
Unit (resistance: Ω, capacitance: F)

*: Polyester film capacitor

Note 1: The motor should not be connected to the power switch pin, since transient noise may appear on the amplifier outputs when the motor is started or stopped.

Note 2: Audio mute is enabled by connecting a 300 Ω resistance between the DC pin and ground. DC bias control of both the stereo (L ch, R ch) and BTL (super bass) channels is enabled, and all audio output signals can be muted by controlling the MUTE pin.

Sample Printed Circuit Pattern



*: Polyester film capacitor

Cu foiled side 112 × 70 mm²

※: Insert 0.15 µF between power supply and ground at the root of the pins.

Unit (resistance: Ω, capacitance: F)

Pin Voltages

Pin No.	1	2	3	4	5	6	7	8	9
Name	OUT No	PWR GND 2	OUT Inv	BS R	OUT R	PWR GND 1	BS L	OUT L	V_{CC} 1
Pin voltage (V)	4.0	0	4.0	8.1	4.5	0	8.1	4.0	9.0

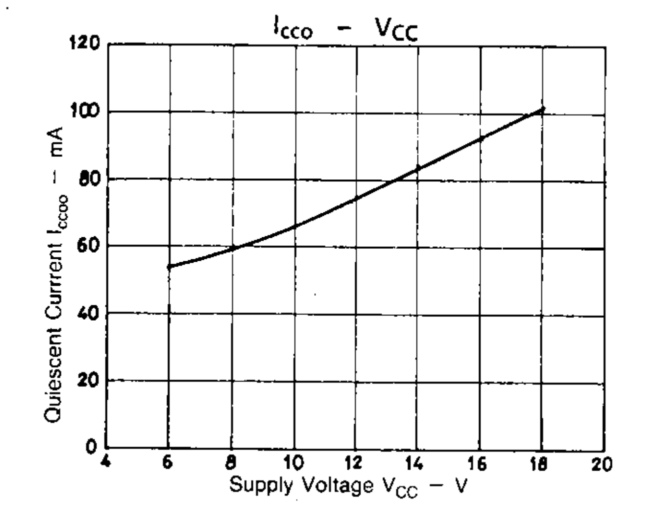
Pin No.	10	11	12	13	14	15	16	17	18
Name	DC	IN L	IN R	PRE GND	IN No	NF Inv	NF No	PWR SW	V_{CC} 2
Pin voltage (V)	4.5	1.4	1.4	0	21 [mV]	1.4	1.4	9.0	9.0

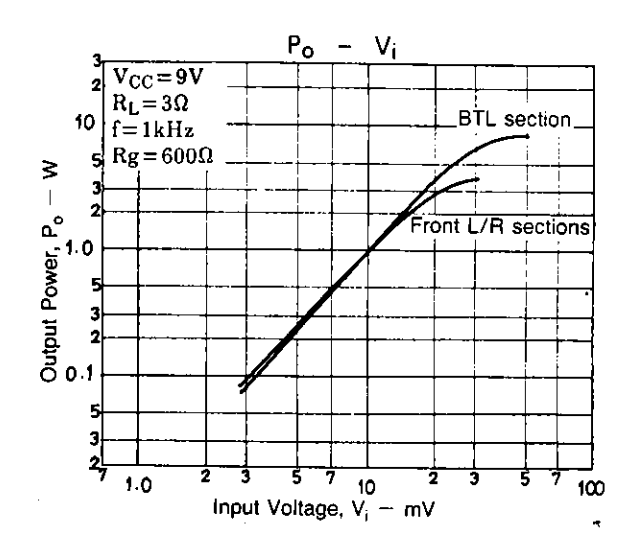
P_o Chart (THD=10%)

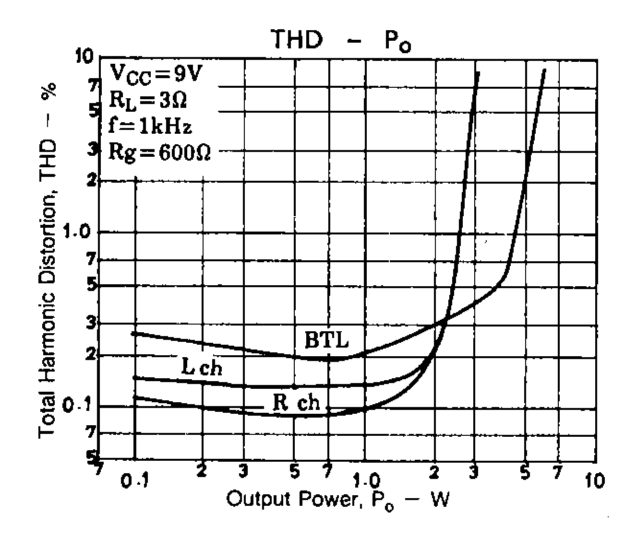
Item	R_L	9V	12V	15V
FRONT L/R	8Ω	1.4W	2.5W	3.9W
	6Ω	1.75W	3.2W	5.0W
	4Ω	2.4W	4.3W	6.4W
	3Ω	3.2W	5.6W	—
BTL	8Ω	3.2W	6.4W	11.0W
	6Ω	4.0W	8.1W	13.5W
	4Ω	5.3W	10.4W	—
	3Ω	6.4W	12.4W	—

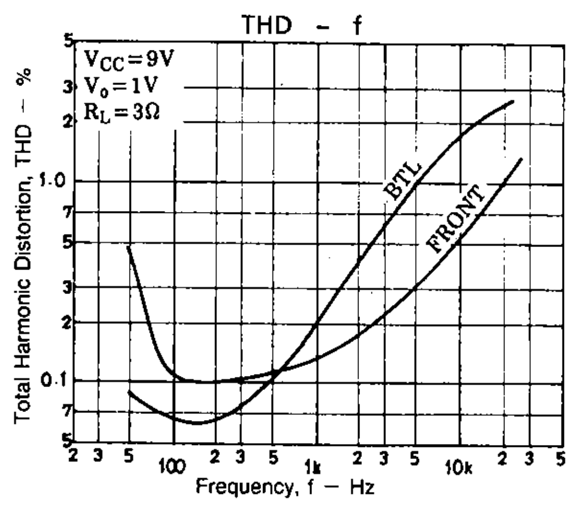
Pdmax Chart

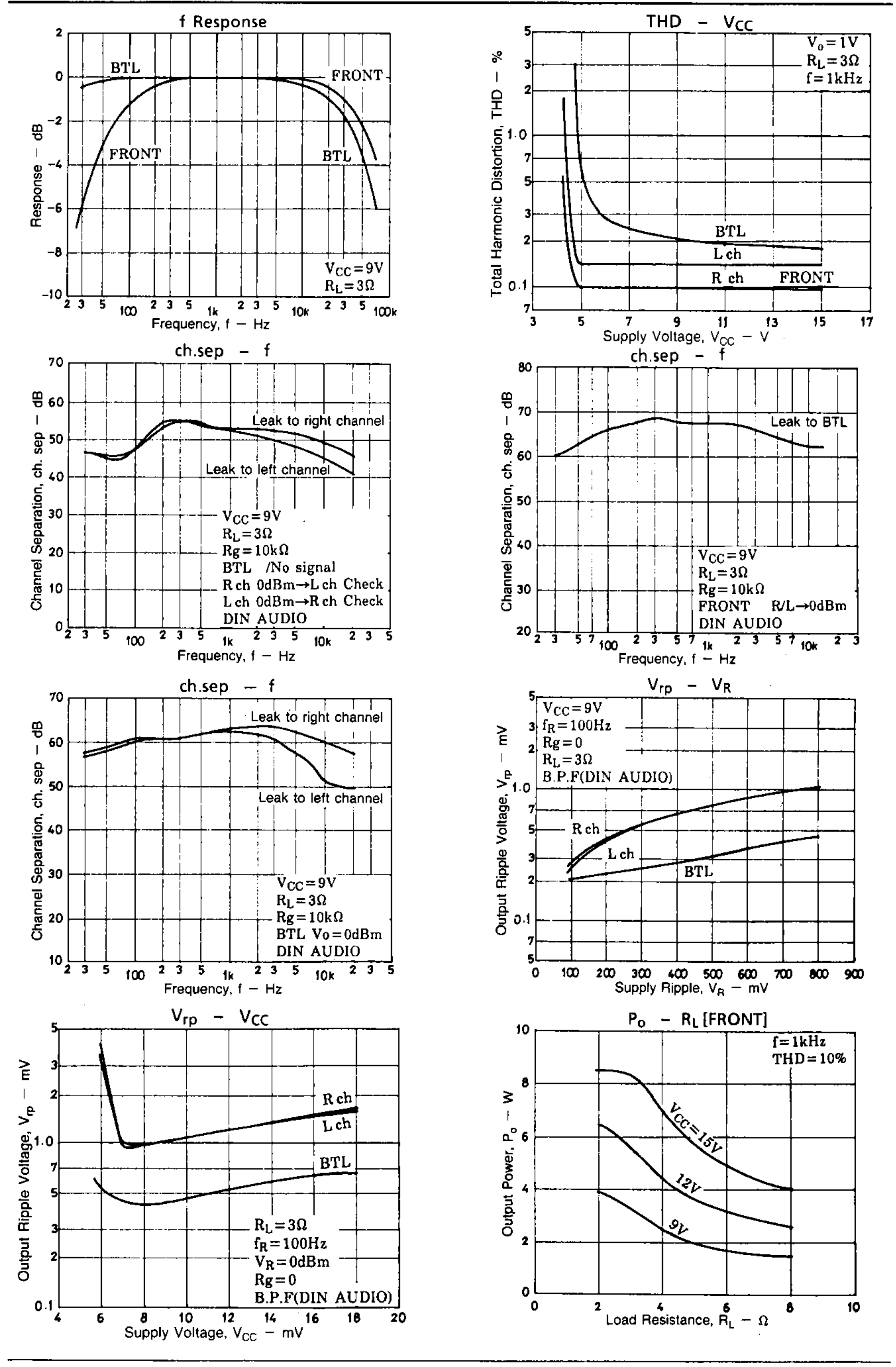
Item	R_L	9V	12V	15V
FRONT L/R	8Ω	2.0W	3.2W	4.6W
	6Ω	2.4W	3.8W	5.7W
	4Ω	3.1W	5.0W	5.4W
	3Ω	3.8W	6.2W	—
BTL	8Ω	2.8W	4.8W	7.2W
	6Ω	3.6W	6.0W	9.0W
	4Ω	5.0W	8.8W	—
	3Ω	6.3W	11.2W	—

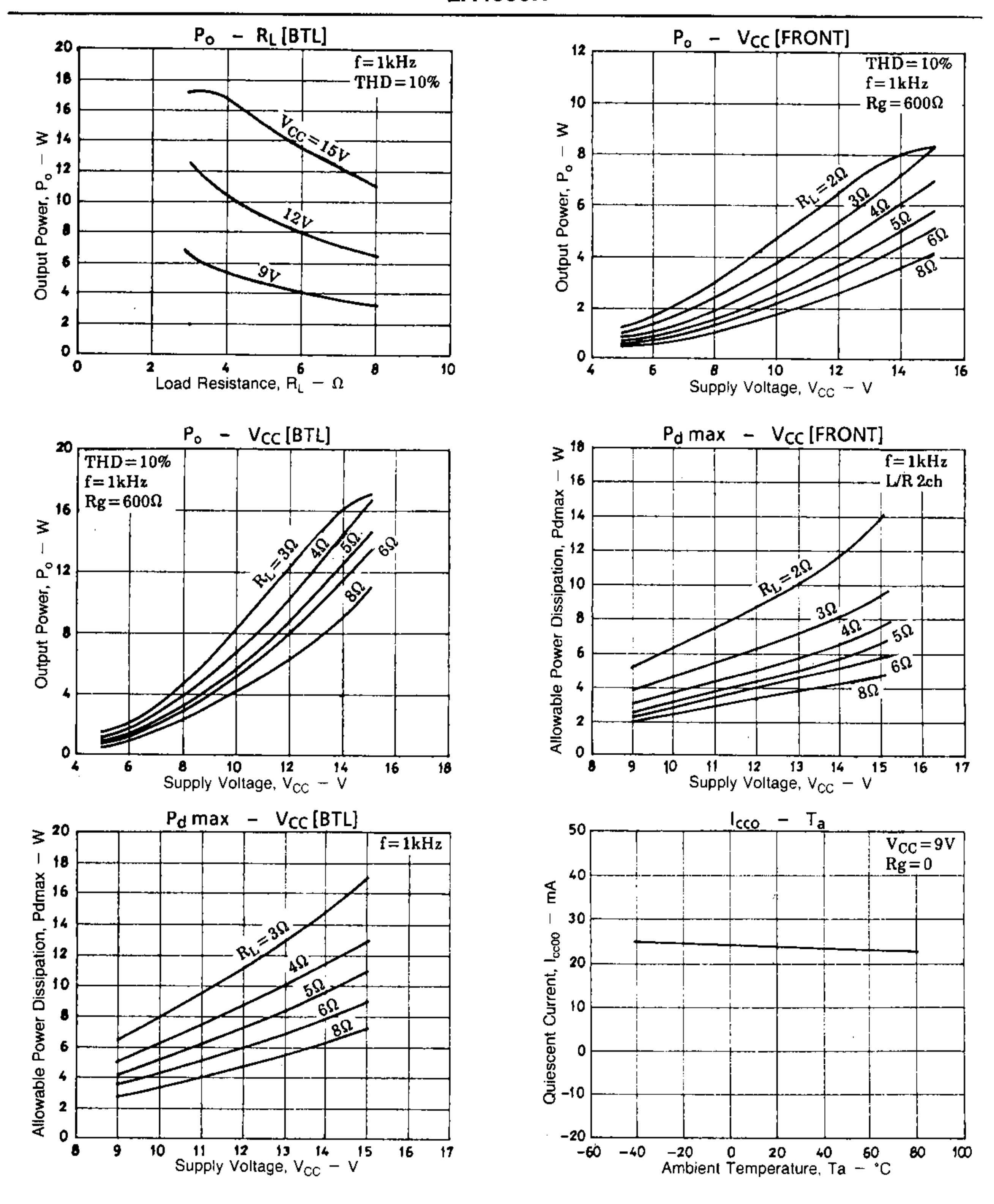









f Response
BTL
FRONT
FRONT
BTL
VCC=9V
RL=3Ω
Response − dB
Frequency, f − Hz
THD − VCC
Vo=1V
RL=3Ω
f=1kHz
BTL
L ch
R ch
FRONT
Total Harmonic Distortion, THD − %
Supply Voltage, VCC − V
ch.sep − f
Leak to right channel
Leak to left channel
VCC=9V
RL=3Ω
Rg=10kΩ
BTL /No signal
R ch 0dBm→L ch Check
L ch 0dBm→R ch Check
DIN AUDIO
Channel Separation, ch. sep − dB
Frequency, f − Hz
ch.sep − f
Leak to BTL
VCC=9V
RL=3Ω
Rg=10kΩ
FRONT R/L→0dBm
DIN AUDIO
Channel Separation, ch. sep − dB
Frequency, f − Hz
ch.sep − f
Leak to right channel
Leak to left channel
VCC=9V
RL=3Ω
Rg=10kΩ
BTL Vo=0dBm
DIN AUDIO
Channel Separation, ch. sep − dB
Frequency, f − Hz
Vrp − VR
VCC=9V
fR=100Hz
Rg=0
RL=3Ω
B.P.F(DIN AUDIO)
R ch
L ch
BTL
Output Ripple Voltage, Vrp − mV
Supply Ripple, VR − mV
Vrp − VCC
R ch
L ch
BTL
RL=3Ω
fR=100Hz
VR=0dBm
Rg=0
B.P.F(DIN AUDIO)
Output Ripple Voltage, Vrp − mV
Supply Voltage, VCC − mV
Po − RL [FRONT]
f=1kHz
THD=10%
VCC=15V
12V
9V
Output Power, Po − W
Load Resistance, RL − Ω

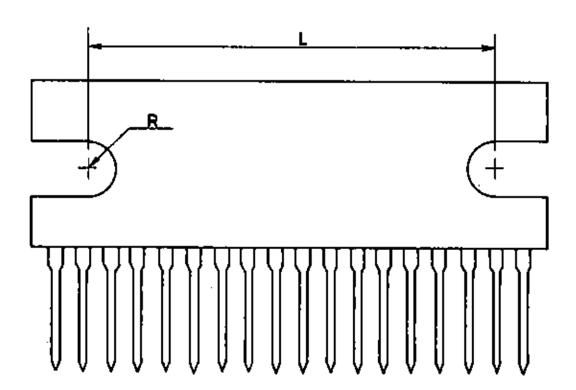


Notes on using this IC

- Always short power supply pins 9 and 16 on the copper foil of the printed circuit pattern and apply the equivalent power supply voltage.
- Pin 17 is designed for the power switch.
  It can be switched on and off with a small current capacitance switch, but the point to watch out for is that if the voltage loss between pins 17 and 18 is too large, there may be problems in the biasing and the power may drop.
- When switching with a transistor, the general practice is to insert a PNP transistor between pins 17 and 18.

Notes on Mounting Radiator Fin

1. The tightening torque should be in the range of 4 to 6 kg-cm.
2. The distance between screw holes of the radiator fin must coincide with the distance between screw holes of the IC. With case outline dimensions L and R referred to the screws must be tightened with the distance between them as close to each other as possible.



3. The screws to be used must have a head equivalent to the one of truss machine screw or binder machine screw defined by JIS. Washers must be also used to protect the IC case.
4. No foreign matter such as cutting particles shall exist between heat sink and radiator fin. When applying grease on the junction surface, it must be applied uniformly on the whole surface.
5. IC lead pins are soldered to the printed circuit board after the radiator fin is mounted on the IC.